SYMMETRIES OF THE ALPHABET

A. ROSS ECKLER
Morristown, New Jersey

The letters of the alphabet exhibit five varieties of symmetry (or non-symmetry):

A M T U V W Y have left-right (vertical) symmetry (.272) v
B C D E K have up-down (horizontal) symmetry (.218) h
N S Z have 180° (rotational) symmetry (.137) r
H I O X have all three symmetries (.205) a
F G J L P Q R have no symmetry (,168) n

In running text, thee various symmetries appear with the indicated probabilities; for example, left-right symmetry occurs twice as often as rotational symmetry,

These appear to be all the possible theoretical symmetries. In particular, it is impossible to create a "letter" with two but not three symmetries, i.e., with left-right and rotational (but not up-down), with up-down and rotational (but not left-right), or with left-right and up-down (but not rotational) symmetry.

Can one locate a set of 120 five-letter heterograms which contain one letter with each kind of symmetry, arranged in all possible symmetry orders? Using only words in boldface from Webster's Second or Third (plus inferred forms such as past tenses and plurals), it appears to be impossible. One difficulty appears to be that vowels are contained in only 3 of the 5 symmetries. If one allows OED words or placenames, however, then a full collection is likely possible.

The collection below is restricted to Websterian words. Each possible ordering is identified by lower-case letters vhran. Although only a couple of examples are typically shown, a few orders are especially fecund:

navhr GIVEN LIVEN RIVEN GIVES LIVES FIVES RIVES LIMES RIMES RITES LOVES LOADS ROADS GOALS
hnavr CLOYS CLOTS BLOTS BLOWS BROWS CROWS BLOWN BROWN CROWN CLOWN BRIMS DROWN
rvanh SMILE SMIRK SHORE SWORD STILE SWIPE STOLE STOPE STORE STORK

ahnrv
ahnvr HEFTS
ahrnv HENRY
ahrvn
ahvnr HEAPS HEALS
ahvrn
anhrv OLENT
anhvr OREAS
anrhv
anrvh
anvhr OFTEN
anvrh
arhnv INEPT INERT
arhvn INCUR
arnhv INLET
arnvh INRUB
arvhn INTER
arvnh INURE
avhnr OWERS
avhrn
avnhr HARES
avnrh HALSE
avrhn OWNER HAZEL
avrnh HAZLE
hanrv CORNY
hanvr KORAN BOGUS
harnv CONGA DINGY
harvn DINAR
havnr BOARS CHAPS
havrn BHANG

hnarv BRINY KRONA
hnavr BROWN CLOTS
hnrav EPSOM
hnrva
hnvar DRAIN BLITZ
hnvra BRUSH CLASH
hranv
hravn
hrnav ENJOY
hrnva

hrvan ESTOP
hrvna
hvanr BAIRN CAIRN
hvarn DYING
hvnar BARON CAPON
hvnra DARSO
hvran BASIL
hvrna BNJO
nahrv POESY
nahvr FOCUS LOCUS

narhv FONDU RISKY
narvh GONAD
navhr GIVEN LOVES
navrh FOUND PHASE
nharv FEINT PEONY
nhavr REOWN
nhrav RESOW
nhrva PESTO LENTO
nhvar LEMON
nhvra LEASH

nrahv
nravh GNOME
nrhav
nrhva
nrvah
nrvha PSYCH
nvahr RAIDS
nvarh GUISE
nvhar RADON
nvhra

nvrah PANIC RUNIC
nvrha LYNCH JUNCO
rahnv NOBLY
rahvn SHEAF SIBYL
ranhv SHREW SILKY
ranvh SHRUB SOLVE
ravhn NITER SOWER
ravnh SHAPE SHARK
rhanv SKIRT
rhavn SCOWL SKIMP

rhnav SCRIM SEPIA
rhnva SERMO SEPTI
rhvan NETOP
rhvna SCAPI
rnahv SPICY SPIKY
rnavh SLIME SPITE
rnhav
rnhva
rnvah SQUIB SQUID
rnvha

rvahn STOEP
rvanh SMILE SMIRK
rvhan NADIR
rvhna SACRO
rvnah SALIC
rvnha
vahnr TIERS
vahrn
vanhr WORDS MILKS
vanrh WORSE

varhn WISER
varnh AISLE TINGE
vhanr ACORN ADORN
vharn
vhnar AEGIS MELON
vhnra VERSO WELSH
vhran TENOR
vhrna
vnahr ALIEN TRIES
vnarh ALONE ARISE

vnhar VLEIS
vnhra
vnrah
vnrha
vrahn USHER
vranh ANILE
vrhan UNDOG
vrhna
vrnah ASPIC
vrnha

Finally, a challenge to computer programmers: can the alphabet be partitioned into five groups so that all 120 permutations can in fact be found among Websterian heteronyms?